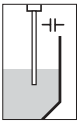
Operating Instructions

VEGACAL 62

Profibus PA



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1 About this document

1.1 Function

This operating instructions manual has all the information you need for quick setup and safe operation. Please read this manual before you start setup.

1.2 Target group

This operating instructions manual is directed to trained, qualified personnel. The contents of this manual should be made available to these personnel and put into practice by them.

1.3 Symbolism used

Information, tip, note
This symbol indicates helpful additional information.

Caution, warning, danger
This symbol informs you of a dangerous situation that could occur. Ignoring this cautionary note can impair the person and/or the instrument.

Ex applications
This symbol indicates special instructions for Ex applications.

● **List**
The dot set in front indicates a list with no implied sequence.

→ **Action**
This arrow indicates a single action.

1 **Sequence**
Numbers set in front indicate successive steps in a procedure.

2 For your safety

2.1 Authorised personnel

All operations described in this operating instructions manual must be carried out only by trained specialist personnel authorised by the operator. For safety and warranty reasons, any internal work on the instruments must be carried out only by personnel authorised by the manufacturer..

2.2 Appropriate use

VEGACAL 62 is a sensor for continuous level measurement.

Detailed information on the application range of VEGACAL 62 is available in chapter "*Product description*".

2.3 Warning about misuse

Inappropriate or incorrect use of the instrument can give rise to application-specific hazards, e.g. vessel overfill or damage to system components through incorrect mounting or adjustment.

2.4 General safety instructions

The VEGACAL 62 is a high-tech instrument requiring the strict observance of standard regulations and guidelines. The user must take note of the safety instructions in this operating instructions manual, the country-specific installation standards (e.g. the VDE regulations in Germany) as well as all prevailing safety regulations and accident prevention rules.

2.5 CE conformity

VEGACAL 62 is in CE conformity with EMC (89/336/EWG) and LVD (73/23/EWG).

Conformity has been judged acc. to the following standards:

- EMC:
  - Emission EN 61326: 2004 (class B)
  - Susceptibility EN 61326: 2004 including supplement A
- LVD: EN 61010-1: 2001

2.6 Compatibility acc. to NAMUR NE 53

VEGACAL 62 meets NAMUR recommendation NE 53. VEGA instruments are generally upward and downward compatible:

- sensor software for DTM-VEGACAL 62 HART, PA or FF
- DTM VEGACAL 62 for adjustment software PACTware™
- adjustment module PLICSCOM for sensor software

The parameter adjustment of the basic sensor functions is independent of the software version. The range of available functions depends on the respective software version of the individual components.

The software version of VEGACAL 62 can be determined as follows:

- via PACTware™
- on the type label of the electronics
- via the indicating and adjustment module PLICSCOM

You can view all software histories on our website www.vega.com. Make use of this advantage and get registered for update information via e-mail.

2.7 Safety information for Ex areas

Please note the Ex-specific safety information for installation and operation in Ex areas. These safety instructions are part of the operating instructions manual and come with the Ex-approved instruments.

2.8 Manufacturer declaration

In conformity with DIN EN 60079-14/2004, para. 5.2.3, point c1, the capacitive probe VEGACAL 62 is suitable for use in zone 2.

The operator must use the instrument correctly and follow the specifications of the following documents:

- this operating instructions manual
- this manufacturer declaration (24640)
- the applicable installation regulations

Max. increase of the surface temperature during operation: 15 K (individual components in the instrument)

With an ambient temperature of +70°C (+158°F) on the housing and a process temperature of +70°C (+158°F), the max. ambient temperature during operation is +95°C (+203°F).

Measures to maintain the explosion protection during operation:

- Operate you instrument in the range of the specified electrical limit values. Permissible supply voltage: see "*Technical data*"
- Mount and operate the instrument in such a way that no ignition danger is expected by electrostatic charges. The process fitting, the plastic-coated/covered probe part or the housing are made of electrically non-conductive plastic (depending on the version).
- Make sure that the seal is mounted correctly between lower part of the housing and cover. Screw the cover on tightly.
- Make sure that there is no explosive atmosphere, if you want to operate the instrument with open cover
- Make sure that the cable gland is tight and strain-relieved. The outer diameter of the connection cable must be adapted to the cable gland. Tighten the pressure screw of the cable gland carefully.
- Cover unused openings for cable glands tightly
- Mount the instrument in such a position that the sensor cannot touch the vessel wall or vessel installations. Keep the influences of product movements in the vessel in mind.
- The surface temperature on the housing must not exceed the ignition temperature of the concerned explosive atmosphere

This instrument was judged by a person that fulfils the requirements acc. to DIN EN 60079-14.

2.9 Environmental instructions

Protection of the environment is one of our most important duties. That is why we have introduced an environment management system with the goal of continuously improving company environmental protection. The environment management system is certified acc. to DIN EN ISO 14001.

Please help us fulfil this obligation by observing the environmental instructions in this manual:

- Chapter "*Storage and transport*"
- Chapter "*Disposal*"

3 Product description

3.1 Configuration

Scope of delivery

The scope of delivery encompasses:

- VEGACAL 62 level switch
- documentation
  - this operating instructions manual
  - Ex-specific safety instructions (with Ex versions), if necessary further certificates.

Components

VEGACAL 62 consists of the following components:

- Process fitting with probe
- Housing with electronics
- Housing cover, optionally available with indicating and adjustment module PLICSCOM

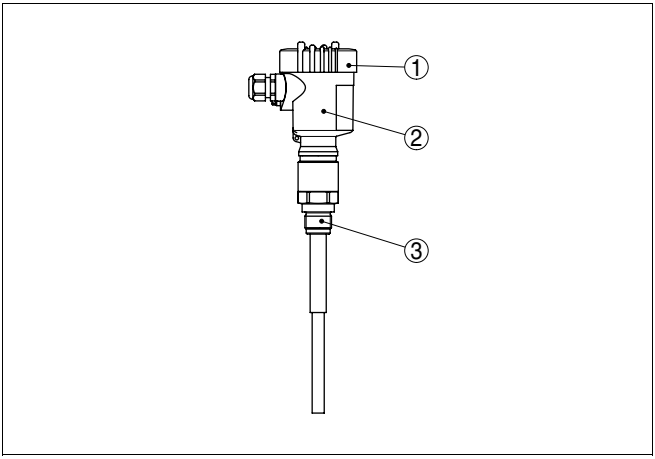

Fig. 1: VEGACAL 62 - rod version with plastic housing
1 Housing cover with integrated PLICSCOM (optional)
2 Housing with electronics
3 Process fitting

3.2 Principle of operation

Area of application

VEGACAL 62 is a level sensor with partly insulated probe for continuous level measurement.

The electronics functions acc. to the admittance principle (phase-selective admittance processing).

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It is designed for industrial use in all areas of process technology and can be applied in all areas of industrial process measurement.

Partly insulated probes such as VEGACAL 62 are preferably used in bulk solids.

However, the probe can also be used in non-conductive liquids such as e.g. oil.

Physical principle

The probe, the measured product and the vessel wall form an electrical capacitor. The capacitance is influenced by three main factors.

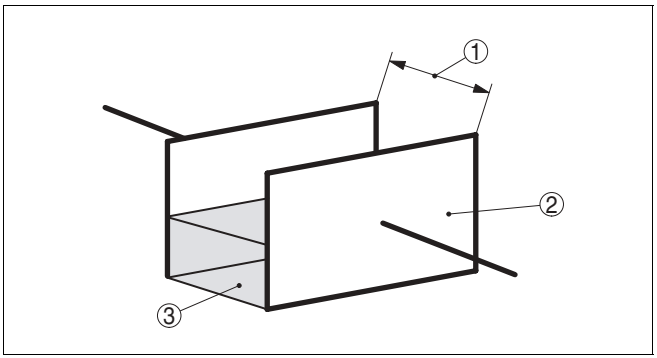

Fig. 2: Functional principle - Plate capacitor
1 Distance between the electrode surfaces
2 Size of the electrode surfaces
3 Type of dielectric between the electrodes

The probe and the vessel wall are the capacitor plates. The measured product is the dielectric. Due to the higher dielectric constant (DK value) of the product compared to air, the capacitance increases as the probe is gradually covered.

The capacitance as well as the resistance change are converted in the oscillator into a level-proportional signal.

Power supply and bus communication

Power supply is via the Profibus DP/PA segment coupler or VEGALOG 571 EP cards. A two-wire cable acc. to Profibus specification serves as carrier of both power and digital data signals for multiple sensors. The instrument profile of VEGACAL 62 corresponds to profile specification version 3.0.

GSD/EDD

The GSD (instrument master files) and bitmap files necessary for planning your Profibus-DP-(PA) communication network are available from the download section on the VEGA

homepage www.vega.com under "*Services - Downloads - Software - Profibus*". There you can also find the appropriate certificates. In a PDM environment, an EDD (Electronic Device Description) is also required to enable the full range of sensor functions (also available as a download).A CD with the appropriate files can be ordered via e-mail under info@de.vega.com or by phone from one of the VEGA agencies under the order number "DRIVER.S".

3.3 Adjustment

VEGACAL 62 can be adjusted with three different adjustment media:

- the indicating and adjustment module PLICSCOM
- with the suitable VEGA DTM in conjunection with an adjustment software acc. to the FDT/DTM standard, e.g. PACTware™ and PC
- the Simatic adjustment program PDM

The entered parameters are generally saved in VEGACAL 62, optionally also in PLICSCOM or in PACTware™.

3.4 Storage and transport

Packaging

Your instrument was protected by packaging during transport. Its capacity to handle normal loads during transport is assured by a test acc. to DIN EN 24180.

The packaging of standard instruments consists of environment-friendly, recyclable cardboard. For special versions, PE foam or PE foil is also used. Dispose of the packaging material via specialised recycling companies.

Storage and transport temperature

- Storage and transport temperature see "*Supplement - Technical data - Ambient conditions*"
- Relative humidity 20 … 85 %

4 Mounting

4.1 General instructions

Installaton location

Select an installation position you can easily reach for mounting and connecting as well as later retrofitting of an indicating and adjustment module. The housing can be rotated by 330° without the use of any tools. You can also install the indicating and adjustment module in four different positions (each displaced by 90°).

Handling

With screwed versions, the housing must not be used for screwing in! Tightening can cause damages on the locking piston of the housing.

To screw in, use the hexagon above the thread.

Moisture

Use the recommended cables (see chapter "*Connecting to power supply*") and tighten the cable gland.

You can give your VEGACAL 62 additional protection against moisture penetration by leading the connection cable downward in front of the cable entry. Rain and condensation water can thus drain off. This applies mainly to mounting outdoors, in areas where moisture is expected (e.g. by cleaning processes) or on cooled or heated vessels.

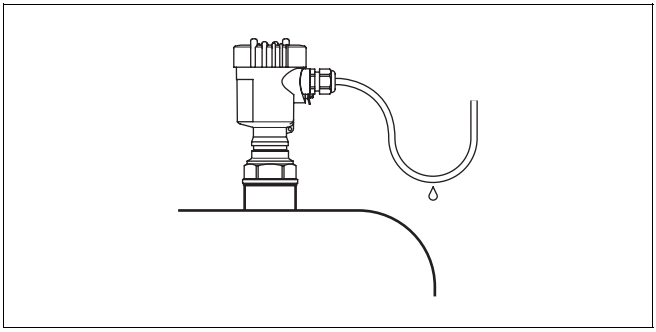

Fig. 3: Measures against moisture penetration

Pressure/Vacuum

The process fitting must be sealed if there is gauge or low pressure in the vessel. Before use, check if the seal material is resistant against the measured product.

Insulating measures, such as e.g. covering the thread with teflon tape, can interrupt the necessary electrical connection with metal vessels. For this reason, ground the probe on the vessel or use a conductive seal material.

Vessel material

Metal vessel

Make sure that the mechanical connection of the probe to the vessel is electrically conductive to ensure sufficient grounding.

Use conductive seals such as e.g. copper or lead etc. Insulating measures, such as covering the thread with Teflon tape, can interrupt the necessary electrical connection with metal vessels. For this reason, ground the probe on the vessel or use a conductive seal material.

Non-conductive vessel

In non-conductive vessels, e.g. plastic tanks, the second pole of the capacitor must be provided separately, e.g. in the form of a concentric tube.

Vessel forms

If possible, the capacitive probe should be mounted vertically or parallel to the counter electrode. This applies particularly to applications in non-conductive products.

In cylindrical tanks, spherical tanks or other asymmetrical tank forms, nonlinear level values are generated due to the varying distance to the vessel wall.

Use a concentric tube in non-conductive products or linearize the meas. signal.

Condensation

If condensate forms on the vessel top, the run-off liquid can cause bridging and hence measurement errors.

For this reason, use a screening tube or a longer insulation. The length depends on the amount of condensate and the drain-off behaviour of the product.

4.2 Mounting information

Mounting position

During operation, the probe must not touch any installations or the vessel wall. The measured value can also change if the distance to the vessel wall changes considerably. If necessary, secure the end of the probe (insulated).

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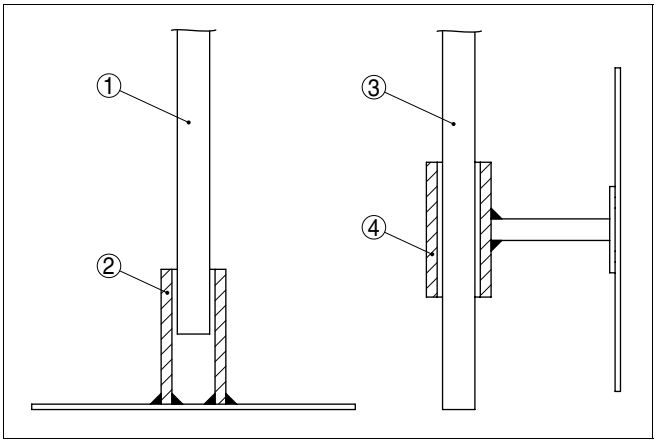


Fig. 4: Fasten the probe
1 Probe
2 Plastic sleeve

In vessels with conical bottom it can be advantageous to mount the sensor in the center of the vessel, as measurement is then possible down to the lowest point of the vessel bottom.

Inflowing material

If VEGACAL 62 is mounted in the filling stream, measurement errors can result. Mount VEGACAL 62 at a location in the vessel where no disturbing influence from e.g. filling openings, agitators, etc. can occur.

This applies particularly to instrument versions with a longer probe.

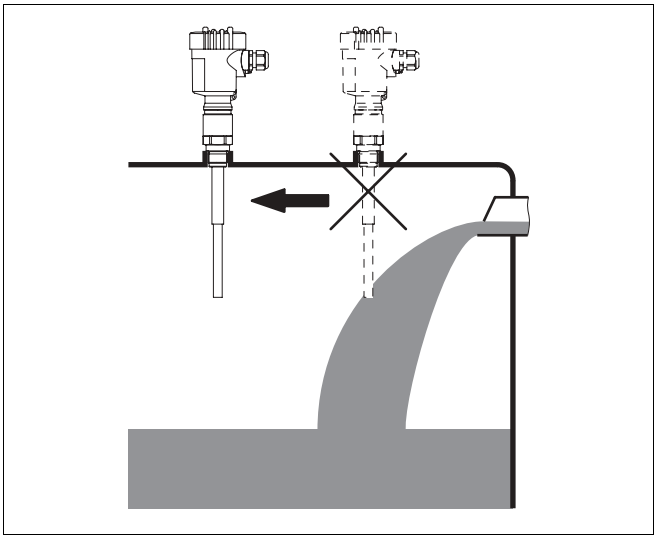


Fig. 5: Inflowing material

5 Connecting to power supply

5.1 Preparing the connection

Note safety instructions

Always observe the following safety instructions:

- Connect only in the complete absence of line voltage
- If overvoltages are expected, overvoltage arresters should be installed acc. to Profibus specification.

Take note of safety instructions for Ex applications

In hazardous areas you should take note of the appropriate regulations, conformity and type approval certificates of the sensors and power supply units.

Select power supply

Power is supplied via a Profibus DP/PA segment coupler or a VEGALOG 571 EP input card. The power supply range can differ depending on the instrument version. The exact range is stated in the "*Technical data*" in the "*Supplement*".

Select connection cable

VEGACAL 62 is connected with screened cable acc. to the Profibus specification. Power supply and digital bus signal are carried over the same two-wire connection cable.

An outer cable diameter of 5 … 9 mm ensures the seal effect of the cable entry.

Please make sure that your installation is carried out acc. to the Profibus specification. In particular, make sure that the termination of the bus is done with appropriate terminating resistors.

Cable gland ½ NPT

On VEGACAL 62 with cable gland ½ NPT and plastic housing, a metal ½" threaded insert is moulded in the plastic housing.

Caution:
No grease should be used when screwing the NPT cable gland or steel tube into the threaded insert. Standard grease can contain additives affecting the connection between threaded insert and housing. This will influence the stability of the connection and the tightness of the housing.

Cable screening and grounding

In systems with potential equalisation, connect the cable screen directly to ground potential at the power supply unit, in the connection box and at the sensor. The screen in the sensor must be connected directly to the internal ground terminal. The ground terminal outside on the housing must be connected to the potential equalisation (low impedance).

In systems without potential equalisation, connect the cable screen directly to ground potential at the power supply unit and at the sensor. In the connection box or T-distributor, the screen of the short stub to the sensor must not be connected to ground potential or to another cable screen. The cable screens to the power supply unit and to the next distributor must be connected to each other and also connected to ground potential via a ceramic capacitor (e.g. 1 nF, 1500 V). The low frequency potential equalisation currents are thus suppressed, but the protective effect against high frequency interference signals remains.

The total capacitance of the cable and of all capacitors must not exceed 10 nF in Ex applications.

Select connection cable for Ex applications

Take note of the corresponding installation regulations for Ex applications. In particular, make sure that no potential equalisation currents flow over the cable screen. In case of grounding on both sides this can be achieved by the use of a capacitor or a separate potential equalisation.

5.2 Connection steps

Proceed as follows:

1 Unscrew the housing cover

2 If an indicating and adjustment module is installed, remove it by turning it slightly to the left.

3 Loosen compression nut of the cable entry

4 Remove approx. 10 cm (4 in) of the cable mantle, strip approx. 1 cm (0.4 in) insulation from the ends of the individual wires

5 Insert the cable into the sensor through the cable entry

6 Lift the opening levers of the terminals with a screwdriver (see following illustration)

7 Insert the wire ends into the open terminals according to the wiring plan

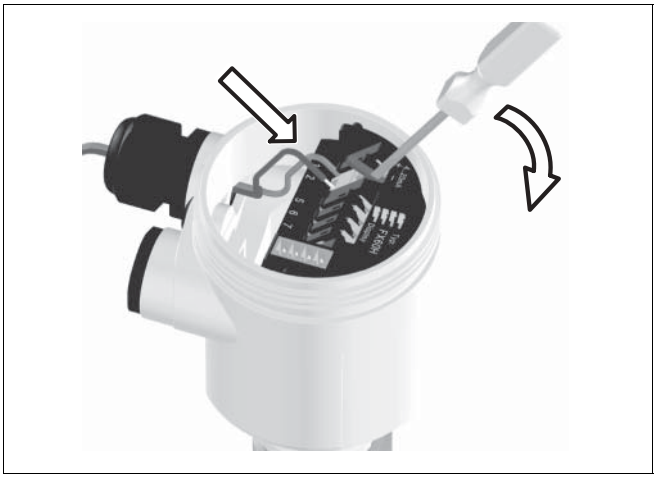


Fig. 6: Connection steps 6 and 7

8 Press down the opening lever of the terminals, you will hear the terminal spring closing.

9 Check the hold of the wires in the terminals by lightly pulling on them

10 Connect the screen to the internal ground terminal and the external ground terminal to potential equalisation

11 Tighten the compression nut of the cable entry, the seal ring must completely encircle the cable

12 Screw the housing cover back on

The electrical connection is finished.

5.3 Wiring plans, single chamber housing

The following illustrations apply to the non-Ex as well as to the Ex ia version.

Housing overview

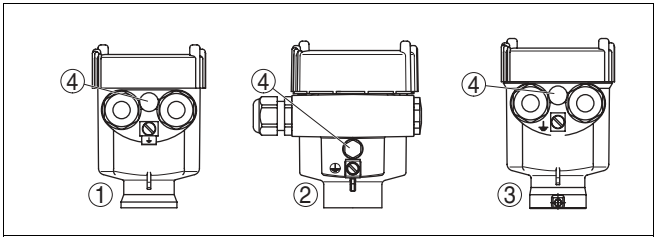


Fig. 7: Material versions, single chamber housing
1 Plastic
2 Aluminium
3 Stainless steel
4 Filter element for pressure compensation or blind stopper with version IP 66/ IP 68, 1 bar

Electronics and connection compartment

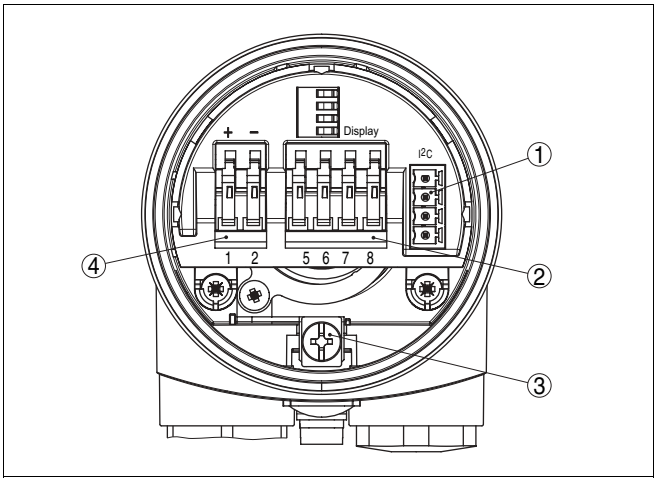


Fig. 8: Electronics and connection compartment, single chamber housing
1 Plug connector for VEGACONNECT (I^2C interface)
2 Spring-loaded terminals for connection of the external indication VEGADIS 61
3 Ground terminal for connection of the cable screen
4 Spring-loaded terminals for power supply

Wiring plan

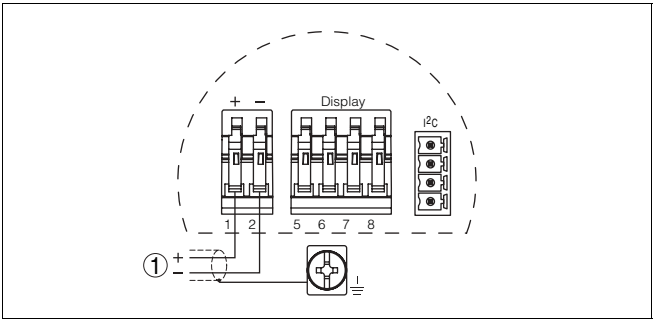


Fig. 9: Wiring plan, single chamber housing
1 Power supply/Signal output

5.4 Wiring plans, double chamber housing

The following illustration apply to non-Ex as well as Ex ia versions. The Exd version is described in the next subchapter.

Housing overview

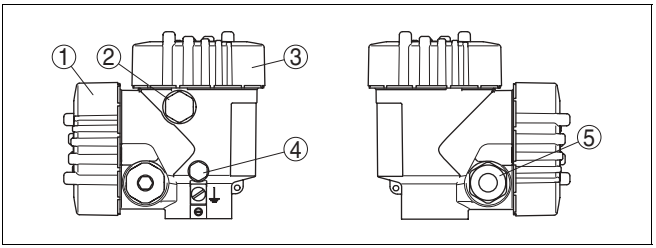


Fig. 10: Double chamber housing
1 Housing cover, connection compartment
2 Blind stopper or plug M12x1 for VEGADIS 61 (option)
3 Housing cover, electronics compartment
4 Filter element for pressure compensation or blind stopper with version IP 66/ IP 68, 1 bar[1)]
5 Cable entry or plug

1) Version IP 66/IP 68, 1 bar not with four-wire instruments.

Electronics compartment

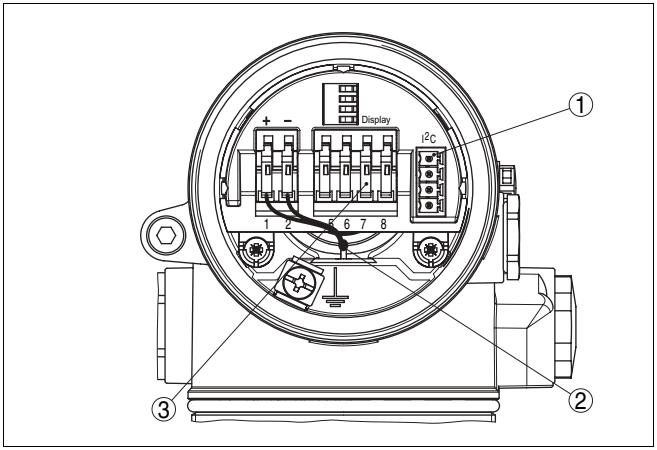


Fig. 11: Electronics compartment, double chamber housing
1 Plug connector for VEGACONNECT (I^2C interface)
2 Internal connection cable to the connection compartment
3 Terminals for VEGADIS 61

Connection compartment

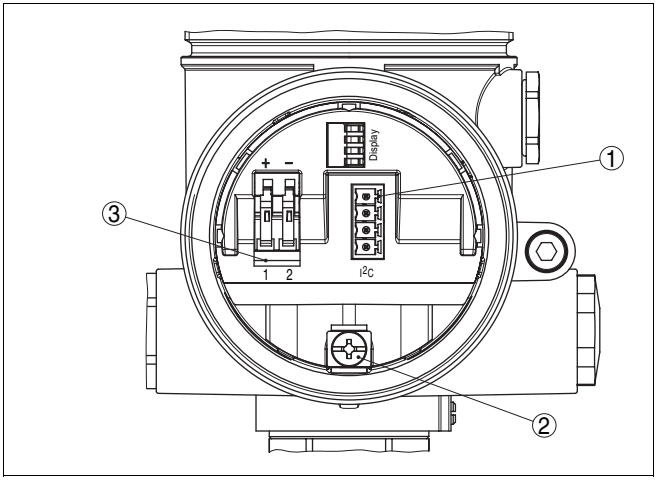


Fig. 12: Connection compartment, double chamber housing
1 Plug connector for VEGACONNECT (I^2C interface)
2 Ground terminal for connection of the cable screen
3 Spring-loaded terminals for power supply

Wiring plan

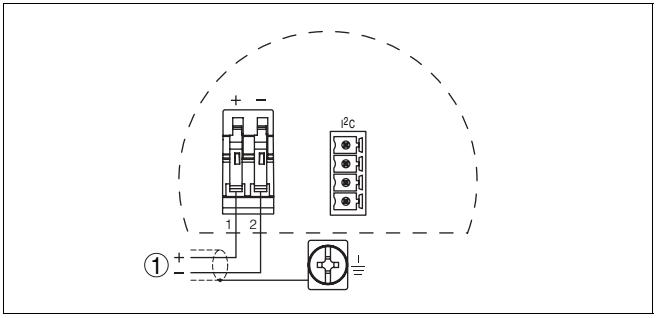


Fig. 13: Wiring plan, double chamber housing
1 Power supply/Signal output

5.5 Wiring plans, double chamber housing Exd

Housing overview

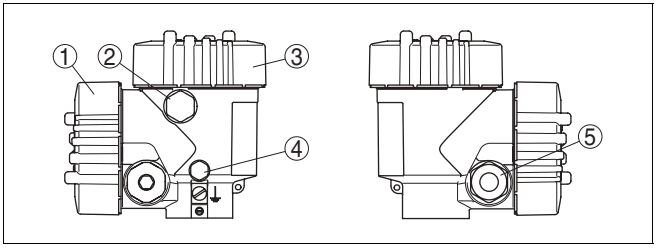


Fig. 14: Double chamber housing
1 Housing cover, connection compartment
2 Blind stopper or plug M12x1 for VEGADIS 61 (option)
3 Housing cover, electronics compartment
4 Filter element for pressure compensation or blind stopper with version IP 66/ IP 68, 1 bar[2)]
5 Cable entry or plug

[2)] Version IP 66/IP 68, 1 bar not with four-wire instruments.

Electronics compartment

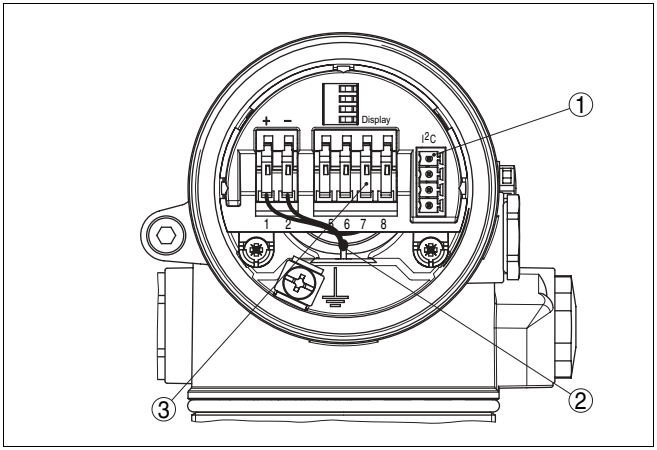


Fig. 15: Electronics compartment, double chamber housing
1 Plug connector for VEGACONNECT (I^2C interface)
2 Internal connection cable to the connection compartment
3 Terminals for VEGADIS 61

Connection compartment

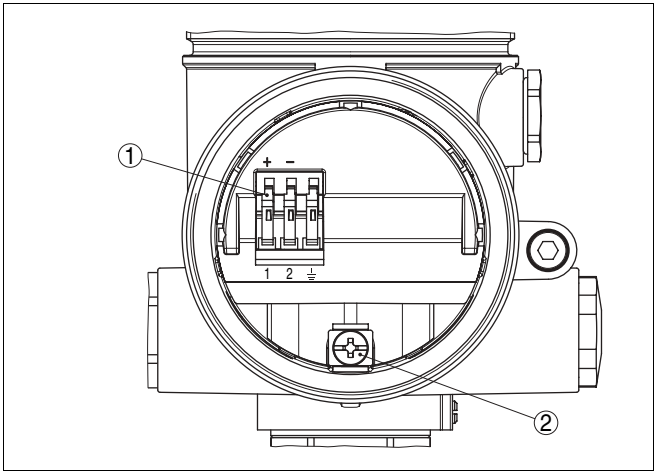


Fig. 16: Connection compartment, double chamber housing Exd
1 Spring-loaded terminals for power supply and cable screen
2 Ground terminal for connection of the cable screen

Wiring plan

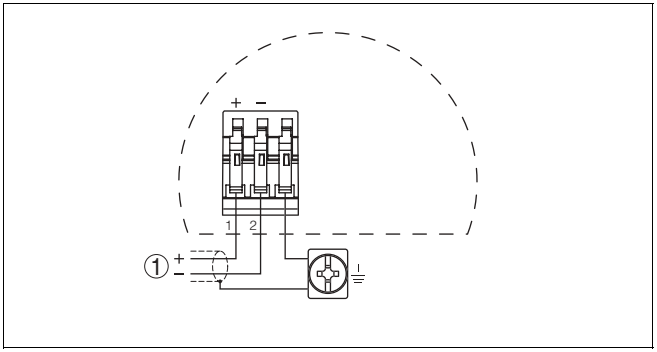


Fig. 17: Wiring plan, double chamber housing Exd
1 Power supply/Signal output

5.6 Wiring plans, version IP 66/IP 68, 1 bar

Wire assignment, connection cable

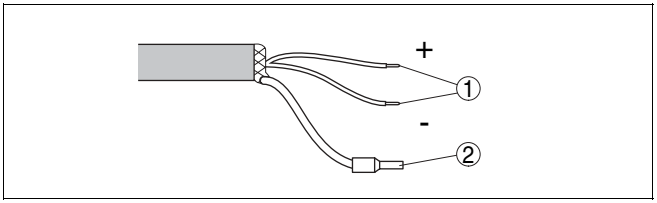


Fig. 18: Wire assignment, connection cable
1 br (+) and bl (-) for power supply or to the processing system
2 Screen

6 Setup with the indicating and adjustment module PLICSCOM

6.1 Short description

Function/Configuration

The indicating and adjustment module PLICSCOM is used for measured value display, adjustment and diagnosis. It can be mounted in the following housing versions and instruments:

- All sensors of the plics® instrument family, in the single as well as in the double chamber housing (optionally in the electronics or connection compartment)
- External indicating and adjustment unit VEGADIS 61

Note:
You will find detailed information on the adjustment in the operating instructions manual of the indicating and adjustment module PLICSCOM.

6.2 Insert the indicating and adjustment module PLICSCOM

Insert/remove PLICSCOM

PLICSCOM can be inserted or removed at any time. It is not necessary to interrupt the power supply.

Proceed as follows:

1 Unscrew the housing cover

2 Place PLICSCOM in the desired position on the electronics (you can choose any one of four different positions - each displaced by 90°)

3 Press PLICSCOM lightly onto the electronics and turn it to the right until it snaps in.

4 Screw housing cover with inspection window tightly back on

Removal is carried out in reverse order.

PLICSCOM is powered by the sensor, an additional connection is not necessary.

Fig. 19: Installation of PLICSCOM

Note:
If you intend to retrofit VEGACAL 62 with a PLICSCOM for continuous measured value indication, a higher cover with an inspection glass is required.

6.3 Adjustment system

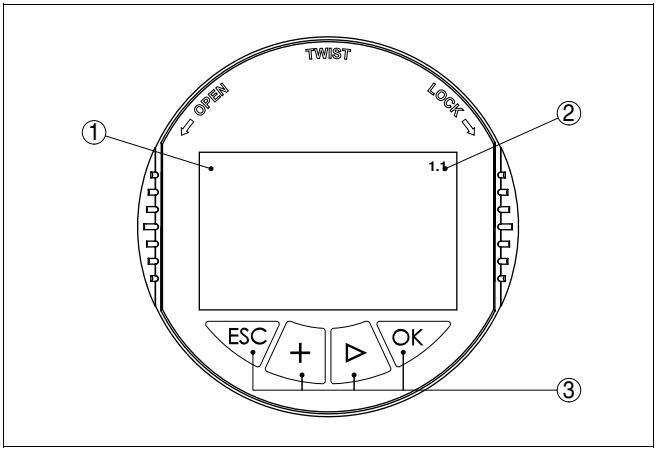


Fig. 20: Indicating and adjustment elements
1 LC display
2 Indication of the menu item number
3 Adjustment keys

Key functions

- ***[OK]*** key:
  - move to the menu overview
  - confirm selected menu
  - edit parameter
  - save value
- ***[->]*** key to select:
  - menu change
  - list entry
  - editing position
- ***[+]*** key:
  - modify value of a parameter
- ***[ESC]*** key:
  - interrupt input
  - jump to the next higher menu

Adjustment system

The sensor is adjusted via the four keys of the indicating and adjustment module. The LC display indicates the individual menu items. The functions of the individual keys are shown in the above illustration. Approx. 10 minutes after the last pressing of a key, an automatic reset to measured value indication is triggered. Any values not confirmed with ***[OK]*** will not be saved.

6.4 Setup procedure

Switch on phase

After VEGACAL 62 is connected to voltage supply or after voltage recurrence, the instrument carries out a self-test for approx. 30 seconds. The following steps are carried out:

- Internal check of the electronics
- Indication of the instrument type, the firmware version as well as the sensor TAGs (sensor name)
- status byte goes briefly to fault value

Then the current measured value will be displayed and the corresponding digital output signal will be outputted to the cable.[3)]

Address setting

Before starting the actual parameter adjustment of a Profibus PA sensor, the address setting must first be carried out. You will find a detailed description in the operating instructions manual of PLICSCOM or in the online help of PACTware™ or DTM.

Parameter adjustment

VEGACAL 62 measures the capacitance of the respective product. To display the actual level of the product, an allocation of the measured capacitance to the percentage height must be carried out. For this adjustment, the capacitance is entered with emptied and filled vessel.

If the vessel cannot be emptied or filled completely, you can carry out the adjustment also with two known levels - for example with 10 % and 90 %. The difference between the empty and full adjustment values should be as large as possible.

The actual level can then be calculated on the basis of these settings.

VEGACAL 62 must be installed. A change of level is necessary for this adjustment.

In the main menu item "*Basic adjustment*", the individual submenu items should be selected one after the other and provided with the correct parameter values.

Tip:
If the indicating and adjustment module PLICSCOM remains on the probe as a display, we recommend saving the sensor data in PLICSCOM.

[3)] The values correspond to the actual level as well as to the settings already carried out, e.g. default setting.

Use the function "Copy sensor data".

Start your parameter adjustment with the following menu items of the basic adjustment:

Carrying out min. adjustment

To be on the safe side, note the adjustment values for full and empty. If an adjustment procedure fails, it is not necessary to again carry out a level change.

These values can be helpful if the electronics has to be exchanged.

	%	Value
Empty adjustment		
Full adjustment		

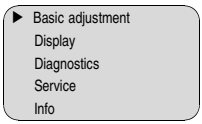
Tab. 2: Adjustment protocol

Tip:
For min. adjustment the vessel should be as empty as possible, and for max. adjustment, as full as possible. If the vessel is already full, start with max. adjustment.

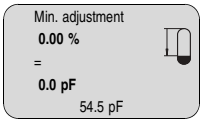
Note:
If possible, the vessel should be as empty as possible for min. adjustment.

Proceed as follows:

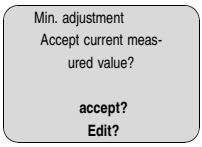
1 Move from the measured value display to the main menu by pushing ***[OK]***.



2 Select the menu item "***Basic adjustment***" with *[->]* and confirm with ***[OK]***. Now the menu item "*Min. adjustment*" is displayed.



3 Prepare the adjustment value for editing with ***[OK]***. Move to the selection window with ***[OK]***.



4 Accept the current measured value or move to the editing window with "Edit". To edit, set the cursor to the requested position with ***[->]***. Set the requested % value with ***[+]*** and save with ***[OK]***. The cursor jumps to the capacitance value.

5 Enter the current capacitance value in pF (displayed below) for the empty vessel corresponding to the percentage value.

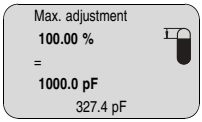
6 Save the settings with ***[OK]*** and move to "Max. adjustment" with ***[->]***.

Carrying out max. adjustment

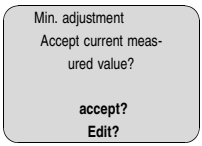
Fill the vessel to the highest possible level.

Note:
For max. adjustment, the vessel should be as full as possible. This will make the calibration more accurate.

Proceed as follows:



1 Prepare the adjustment value for editing with ***[OK]***. Move to the selection window with ***[OK]***.



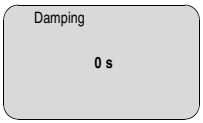
2 Accept the current measured value or move to the editing window with "Edit". To edit, set the cursor to the requested position with ***[->]***. Set the requested % value with ***[+]*** and save with ***[OK]***. The cursor jumps to the capacitance value.

3 Enter the current capacitance value in pF (displayed below) for the full vessel corresponding to the percentage value.

4 Save the settings with ***[OK]***.

Damping

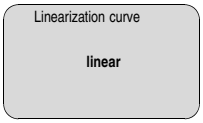
To suppress fluctuation in the measured value display, e.g. caused by an agitated product surface, an integration time can be set. This time can be between 0 and 999 seconds. Keep in mind that this setting will increase the reaction time of the measurement, and that the reaction to quick changes of the measured value will be delayed. In general, a time of a few seconds is sufficient to smooth the measured value display.



Enter the requested parameter via the appropriate keys, save your settings and jump to the next menu item with the ***[->]*** key.

Linearization curve

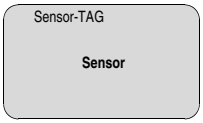
A linearization is necessary for all vessels in which the vessel volume does not increase linearly with the level - e.g. with a cylindrical or spherical tank - and the indication or output of the volume is required. Corresponding linearization curves are preprogrammed for these vessels. They represent the correlation between the level percentage and vessel volume. By activating the appropriate curve, the volume percentage of the vessel is displayed correctly. If the volume should not be displayed in percent but e.g. in l or kg, a scaling can be also set in the menu item "*Display*".



Enter the requested parameter via the appropriate keys, save your settings and jump to the next menu item with the ***[->]*** key.

Sensor-TAG

In this menu item you can enter an unambiguous designation for the sensor, e.g. the measurement loop name or the tank or product designation. In digital systems and in the documentation of larger plants, a singular designation should be entered for exact identification of individual measuring sites.



With this menu item, the Basic adjustment is finished and you can now jump to the main menu with the ***[ESC]*** key.

Optional settings

Additional adjustment and diagnosis options such as e.g. scaling, simulation or trend curve presentation are shown in the following menu schematic. You will find a detailed description of these menu items in the operating instructions manual of the indicating and adjustment module.

Reset

Basic adjustment

If the function "Reset" is carried out, the sensor resets all settings to default.

The following values will be reset:

Function	Reset value
Max. adjustment	3000 pF
Min. adjustment	0 pF
Integration time ti	0 s
Linearization	linear
Sensor-TAG	Sensor
Display	PA-Out 1
Channel (PV)	lin %
Addtl. PA value (PV)	lin %
Out-Scale (unit)	%
PV Out-Scale	0.00 lin-% = 0.0 % 100.0 lin-% = 100 %

Tab. 3: Reset values

Information:
All additional settings are reset to the standard values of the Profibus PA specification.

Special parameters

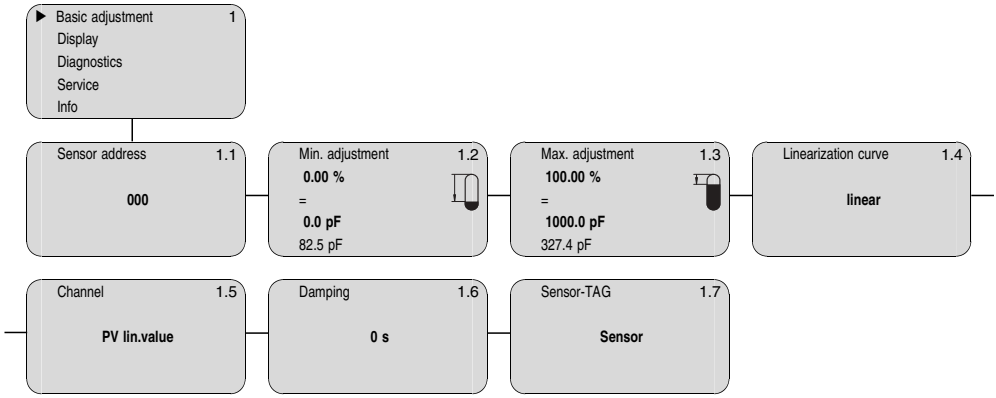
All special parameters are reset to delivery status.

Peak values

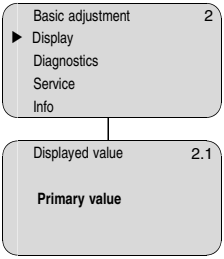
The min. and max. values are reset to the current value.

6.5 Menu schematic

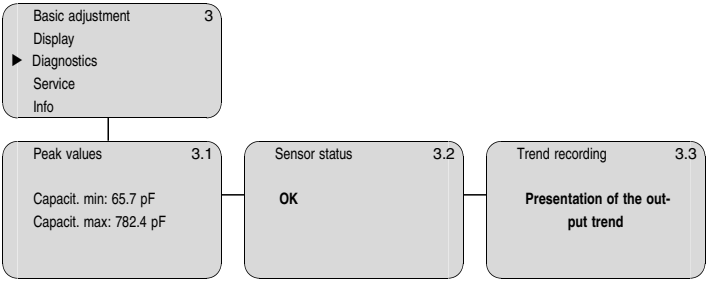
Basic adjustment



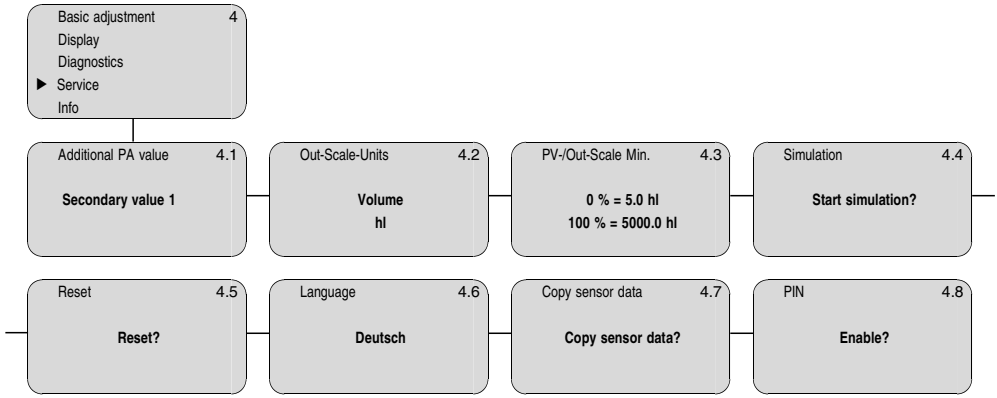
Display



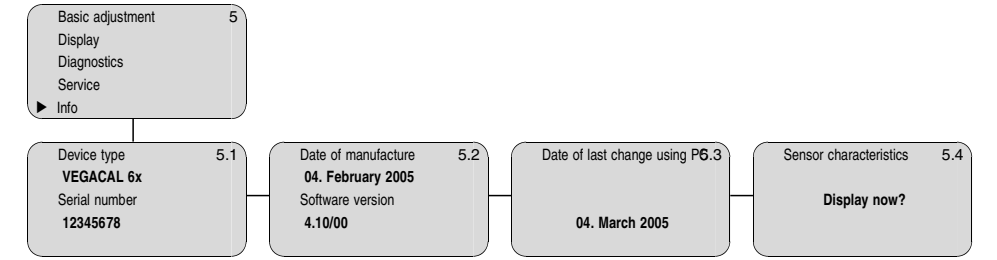
Diagnostics



Service



Info



7 Set up with PACTware™ and other adjustment programs

7.1 Connecting the PC

Connecting the PC directly to the sensor

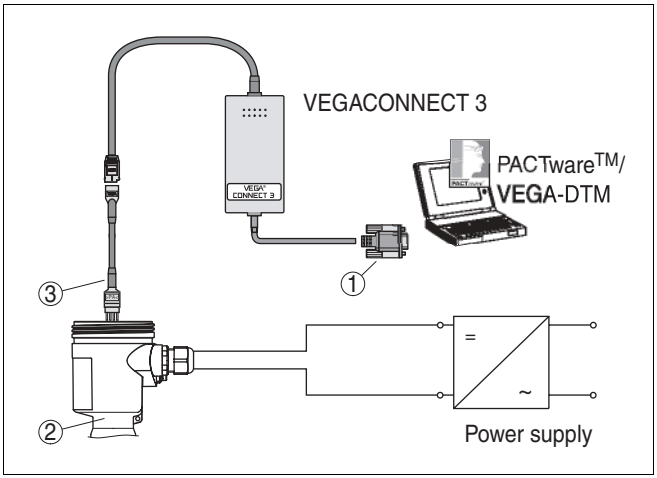


Fig. 21: PC connected directly to the sensor
1 RS232 connection
2 VEGACAL 62
3 I²C adapter cable for VEGACONNECT 3

Necessary components:

- VEGACAL 62
- PC with PACTware™ and suitable VEGA-DTM
- VEGACONNECT 3 with I²C adapter cable (article no. 2.27323)
- Power supply unit

7.2 Parameter adjustment with PACTware™

Further setup steps are described in the operating instructions manual "*DTM Collection/PACTware™*" attached to each CD and which can also be downloaded from our homepage. A detailed description is available in the online help of PACTware™ and the VEGA-DTMs.

Note:
Keep in mind that for setup of VEGACAL 62, DTM-Collection 04/2005 or a newer version must be used.

All currently available VEGA-DTMs are provided in the DTM Collection on CD and can be obtained from the responsible VEGA agency for a token fee. This CD includes also the up-to-date PACTware™ version. The basic version of this DTM Collection incl. PACTware™ is also available as a free-of-charge download from the Internet.

Go via www.vega.com and "*Downloads*" to the item "*Software*".

7.3 Parameter adjustment with PDM

For VEGA sensors device descriptions for the adjustment program PDM are also available as EDD. The device descriptions are already implemented in the current versions of PDM. For older versions of PDM they are available as a free-of-charge download from the Internet.

Go via www.vega.com and "*Downloads*" to the item "*Software*".

7.4 Saving the parameter adjustment data

It is recommended to document or save the parameter adjustment data. They are hence available for multiple use or service purposes.

The VEGA DTM Collection and PACTware™ in the licensed, professional version offer the suitable tools for a systematic project documentation and recording.

8 Maintenance and fault rectification

8.1 Maintenance

When used as directed in normal operation, VEGACAL 62 is completely maintenance-free.

8.2 Fault rectification

Causes of malfunction

VEGACAL 62 offers maximum reliability. Nevertheless faults can occur during operation. These may be caused by the following, e.g.:

- Sensor
- Process
- Supply
- Signal processing

Fault rectification

The first measures to be taken are to check the output signals as well as to evaluate the error messages via the indicating and adjustment module PLICSCOM. The procedure is described below. Further comprehensive diagnostics can be carried out on a laptop with the software PACTware™ and the suitable DTM. In many cases, the causes can be determined in this way and faults can be rectified.

24 hour service hotline

Should the following measures not be successful, please call in urgent cases the VEGA service hotline under the phone number **+49 1805 858550**.

The hotline is available to you 7 days a week round-the-clock. Since we offer this service world-wide, the support is only available in the English language. The service is free of charge, only the standard telephone costs will be charged.

Checking Profibus PA

? When connecting an additional instrument, the segment fails.

- Max. supply current of the segment coupler exceeded

→ Measure the current consumption, reduce size of segment

? Wrong presentation of the measured value in Simatic S5

- Simatic S5 cannot interpret the number format IEEE of the measured value

→ Insert converting component from Siemens

? In Simatic S7 the measured value is always presented as 0

- Only four bytes are consistently loaded in the PLC

→ Use function component SFC 14 to load 5 bytes consistently.

? Measured value on PLICSCOM does not correspond to the PLC

- In the menu item "*Display - Display value*" is not set to "*PA-Out*"

→ Check values and correct, if necessary

? No connection between PLC and PA network

- Incorrect adjustment of the bus parameter and the segment coupler-dependent baud rate

→ Check values and correct, if necessary

? Instrument does not appear during connection setup

- Profibus DP cable pole-reversed

→ Check cable and correct, if necessary

- Incorrect termination

→ Check termination at the beginning and end points of the bus and terminate, if necessary, acc. to the specification

- Instrument not connected to the segment, double assignment of an address

→ Check and correct, if necessary

In Ex applications, the regulations for the wiring of intrinsically safe circuits must be observed.

Error message via PLICSCOM

? E013

- no measured value available

→ Shortcircuit due to bridging of conductive buildup between process fitting and probe

→ Remove buildup - if necessary, mount a protective tube

- Shortcircuit in the probe, e.g. because of moisture in the housing

→ Remove the oscillator and check the resistance between the marked plug connections acc. to the following illustration

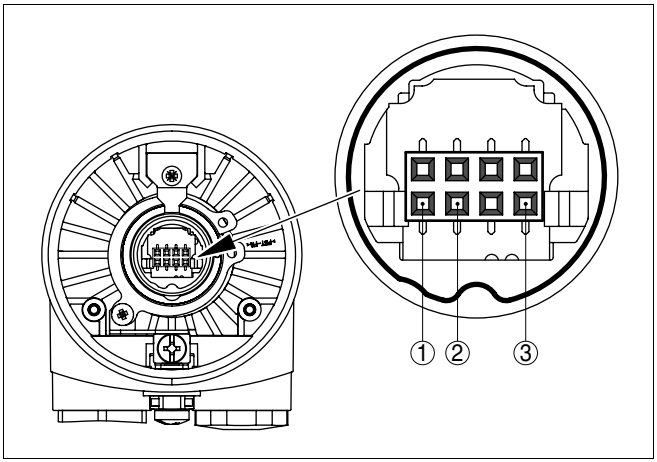


Fig. 22: Check the resistance in the probe
1 Screening
2 Probe
3 Ground potential

→ There should be no contact between any of the terminals (high resistance)

→ However, if there is somehow contact, exchange instrument or return it for repair

? E017

- Adjustment span too small

→ Carry out a fresh adjustment and increase the distance between min. and max. adjustment

? E036

- No operable sensor software

→ Carry out software update or send instrument for repair

? E041/E042/E043

- Hardware error, electronics defective

→ Exchange instrument or return it for repair

? E113

- Communication conflict

→ Exchange instrument or return it for repair

8.3 Exchange of the electronics module

If the electronics module is defective, it can be replaced by the user.

In Ex applications, only an instrument and an electronics module with appropriate Ex approval may be used.

If there is no electronics module available on site, one can be ordered from the VEGA agency serving you.

Sensor serial number

The order data of the sensor must be loaded into the new electronics module. This can be done:

- at the factory by VEGA personnel
- or on site by the user

In both cases, the sensor serial number is necessary. The serial numbers are stated on the type label of the instrument or on the delivery note.

Information:
When loading on site, the order data must be downloaded from the Internet (see Operating Instructions manual of the oscillator).

Assignment

The oscillators are adapted to the respective sensor and differ in their signal output or in their power supply. You can find a suitable oscillator in the following overview.

The oscillators differ only in their signal output and are suitable for all series 60 sensors.

The following types are available:

- CL-E60**H** (4 … 20 mA/HART)
- CL-E60**P** (Profibus PA)
- CL-E60**F** (Foundation Fieldbus)

In Ex applications, only electronics with appropriate Ex approval must be used.

8.4 Shortening the probe

The probe (rod) can be shortened by any length.

1 Shorten the rod with a cut-off wheel or metal saw at the lower end. Make sure the length is correct before shortening.

2 Carry out a new adjustment.

8.5 Instrument repair

If it is necessary to repair, please proceed as follows:

You can download a return form (23 KB) in the Internet from our home page www.vega.com under: "*Downloads - Forms and Certificates - Repair form*".

By doing this you help us carry out the repair quickly and without having to call back for needed information.

- Print and fill out one form per instrument
- Clean the instrument and pack it damage-proof
- Attach the completed form and possibly also a safety data sheet to the instrument
- Please ask the responsible agency for the address of the return shipment!

9 Dismounting

9.1 Dismounting steps

Warning:
Before dismounting, be aware of dangerous process conditions such as e.g. pressure in the vessel, high temperatures, corrosive or toxic products etc.

Take note of the instructions in chapters "*Mounting*" and "*Connecting to power supply*" and carry out the listed steps in reverse order.

9.2 Disposal

VEGACAL 62 consists of materials which can be recycled by specialised recycling companies. We use recyclable materials and have designed the electronic modules to be easily separable.

WEEE directive 2002/96/EG
This instrument is not subject to the WEEE directive 2002/96/EG and the respective national laws (in Germany, e.g. ElektroG). Pass the instrument directly on to a specialised recycling company and do not use the municipal collecting points. These may be used only for privately used products acc. to the WEEE directive.

Correct disposal avoids negative effects to persons and environment and ensures recycling of useful raw materials.

Materials: see "*Technical data*"

If you cannot dispose of the instrument properly, please contact us about disposal methods or return.

10 Supplement

10.1 Technical data

General data

Material 316L corresponds to 1.4404 or 1.4435

Materials, wetted parts

– Process fitting - Thread	316L
– Process fitting - Flange	316L
– Process seal	Klingersil C-4400
– insulation (partly insulated)	PTFE
– Probe (rod PTFE partly insulated ø 12 mm/ø 0.47 in)	316L

Materials, non-wetted parts

– Housing	Plastic PBT (Polyester), Alu die-casting powder-coated, 316L
– Seal ring between housing and housing cover	NBR (stainless steel housing), silicone (Alu/plastic housing)
– Ground terminal	316L

Weights

– with plastic housing	1150 g (40 oz)
– with Aluminium housing	1600 g (56 oz)
– with stainless steel housing	1950 g (69 oz)
– Rod weight ø 12 mm (ø 0.47 in)	900 g/m (10 oz/ft)

Sensor length (L)	0.2 … 6 m (0.7 … 20 ft)
Max. lateral load	10 Nm (7.4 lbf ft)
Max. torque (process fitting thread)	100 Nm (73 lbf ft)

Output variable

Output signal	digital output signal, format acc. to IEEE-754
Sensor address	126 (default setting)
Current value	constantly 10 mA; ±0.5 mA
Integration time (63 % of the input variable)	0 … 999 s, adjustable
Rise time	500 ms (ti: 0 s, 0 … 100 %)

Input variable

Parameter	level of non-conductive liquids and solids
Measuring principle	phase-selective admittance processing (PSA)
Measuring range	0 … 3000 pF
Frequency	270 kHz

Accuracy (similar to DIN EN 60770-1)

Reference conditions acc. to DIN EN 61298-1

– Temperature	+18 … +30°C (+64 … +86°F)
– Relative humidity	45 … 75 %
– Atmospheric pressure	860 … 1060 mbar/86 … 106 kPa (12.5 … 15.4 psi)

Temperature error

– <120 pF	<1 pF
– >120 pF	1 % of the current measured value
Linearity error	<0.25 % of the complete measuring range

Characteristic curve deviation and measurement characteristics

Temperature drift	0.06 %/10 K relating to the max. measuring range

Ambient conditions

Ambient, storage and transport temperature

– without indicating and adjustment module	-40 … +80°C (-40 … +176°F)
– with indicating and adjustment module	-20 … +70°C (-4 … +158°F)

Process conditions

Process pressure	-1 … 64 bar/-100 … 6400 kPa (-14.5 … 928 psi)
Process temperature VEGACAL 62 of 316L	-50 … +150°C (-58 … +302°F)
Process temperature (thread or flange temperature) with temperature adapter (option)	-50 … +200°C (-58 … +392°F)

30025-EN-060224

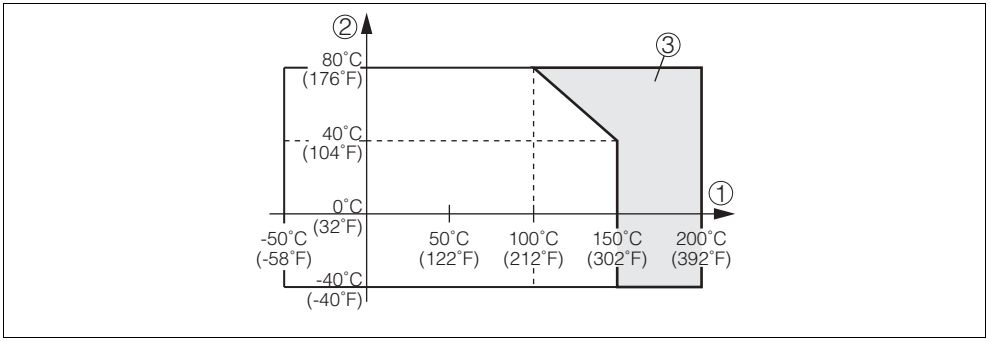


Fig. 23: Ambient temperature - Product temperature
1 Product temperature
2 Ambient temperature
3 Temperature range with temperature adapter

Dielectric figure (DK value)	>1.5

Electromechanical data - version IP 66/IP 67 and IP 66/IP 68; 0.2 bar

Cable entry/plug[4)]

– Single chamber housing
- 1x cable entry M20x1.5 (cable-ø 5 … 9 mm), 1x blind stopper M20x1.5

or:
- 1x closing cap ½ NPT, 1x blind plug ½ NPT

or:
- 1x plug (depending on the version), 1x blind plug M20x1.5

– Double chamber housing
- 1x cable entry M20x1.5 (cable-ø 5 … 9 mm), 1x blind stopper M20x1.5; plug M12x1 for VEGADIS 61 (optional)

or:
- 1x closing cap ½ NPT, 1x blind stopper ½ NPT, plug M12x1 for VEGADIS 61 (optional)

or:
- 1x plug (depending on the version), 1x blind stopper M20x1.5; plug M12x1 for VEGADIS 61 (optional)

Spring-loaded terminals: for wire cross sections up to 2.5 mm²

[4)] Depending on the version M12x1, acc. to DIN 43650, Harting, Amphenol-Tuchel, 7/8" FF

30025-EN-060224

Electromechanical data - version IP 66/IP 68, 1 bar

Cable entry	
– Single chamber housing	• 1x IP 68 cable entry M20x1.5; 1x blind stopper M20x1.5 or: • 1x closing cap ½ NPT, 1x blind plug ½ NPT
– Double chamber housing	• 1x IP 68 cable entry M20x1.5; 1x blind stopper M20x1.5; plug M12x1 for VEGADIS 61 (option) or: • 1x closing cap ½ NPT, 1x blind stopper ½ NPT, plug M12x1 for VEGADIS 61 (optional)
Connection cable	
– Configuration	four cores, one suspension cable, one breather capillary, screen braiding, foil, mantle
– wire cross section	0.5 mm^2
– wire resistance	<0.036 Ohm/m
– tensile load	>1200 N (270 pounds force)
– Standard length	5 m (16.4 ft)
– Max. length	1000 m (3280 ft)
– Min. bending radius	25 mm (at +25°C/+77°F)
– Diameter	approx. 8 mm
– Colour - standard PE	Black
– Colour - standard PUR	Blue
– Colour - Ex version	Blue

Indicating and adjustment module

Power supply and data transmission	through sensor via gold-plated sliding contacts (I^2C bus)
Indication	LC display in dot matrix
Adjustment elements	4 keys
Protection	
– unassembled	IP 20
– mounted into the sensor without cover	IP 40

Materials

– Housing	ABS
– Inspection window	Polyester foil

Voltage supply

Supply voltage

– non-Ex instrument	9 … 32 V DC
– EEx ia instrument	9 … 24 V DC

Power supply by/max. number of sensors

– DP/PA segment coupler	max. 32 (max. 10 with Ex)
– VEGALOG 571 EP card	max. 15 (max. 10 with Ex)

Electrical protective measures

Protection

– Plastic housing	IP 66/IP 67
– Alu and stainless steel standard	IP 66/IP 68 (0.2 bar)[5]
– Alu and stainless housing, optionally available	IP 66/IP 68 (1 bar)
Overvoltage category	III
Protection class	II

Approvals[6]

ATEX II 1G, 1/2G, 2G EEx ia IIC T6

ATEX II 1/2G, 2G EEx d ia IIC T6[7]

ATEX II 1/2D 2D IP6X T[8]

WHG

Ship approvals

[5] Requirement to maintain the protection is the suitable cable.
[6] Deviating data with Ex applications: see separate safety instructions.
[7] Only in conjunction with Aluminium double chamber housing.
[8] Not in conjunction with plastic housing.

10.2 Profibus PA

Instrument master file

The instrument master file (GSD) contains the characteristic data of the Profibus PA instrument. These data are, e.g. the permissible transmission rates as well as information on diagnostics values and the format of the measured value outputted by the PA instrument.

A bitmap file is also provided for the planning tool of the Profibus network. This file is automatically installed with the GSD file. The bitmap file is used for symbolic indication of the PA instrument in the configuration tool.

Ident number

Each Profibus instrument gets an unambiguous ident number (ID number) from the Profibus user organisation (PNO). This ID number is also included in the name of the GSD file. For VEGACAL 62 the ID number is **0x076(hex)** and the GSD file **„CL__076E.GSD“**. Optionally to this manufacturer-specific GSD file, PNO provides also a general so-called profile-specific GSD file. For VEGACAL 62 you have to use the general GSD file **„PA139700.GSD“**. If the general GSD file is used, the sensor must be set to the profile-specific ident number via the DTM software. By default, the sensor operates with the manufacturer-specific ID number.

Cyclical data traffic

The master class 1 (e.g. PLC) cyclically reads out measured values from the sensor during operation. The below block diagram below shows which data can be accessed by the PLC.

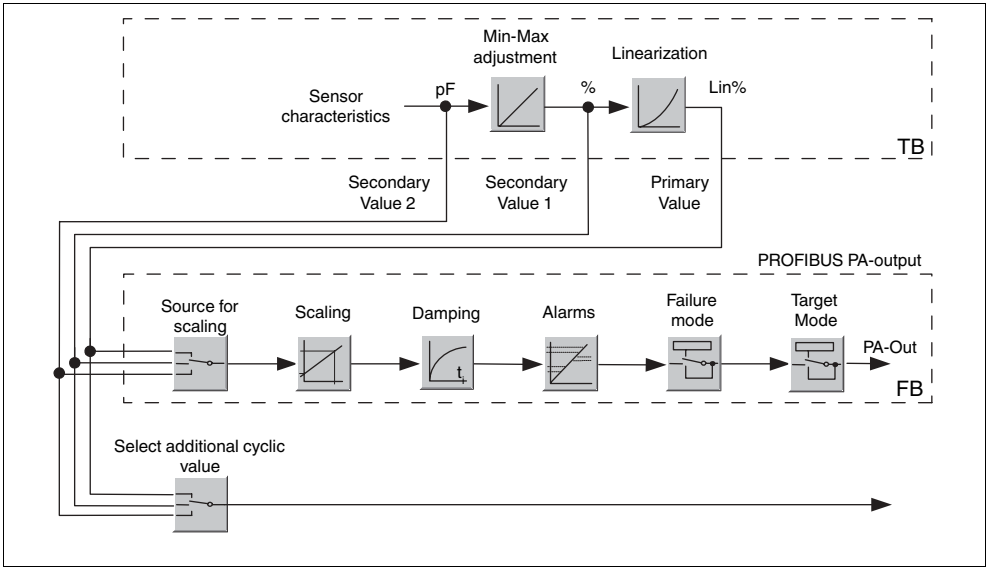


Fig. 24: VEGACAL 62: Block diagram with AI (PA-OUT) value and additional cyclical value
TB Transducer Block
FB Function Block

Module of the PA sensors
For the cyclic data traffic, VEGACAL 62 provides the following modules:

- AI (PA-OUT)
  - PA-OUT value of the FB1 after scaling
- Additional Cyclic Value
  - Additional cyclical value (depending on the source)
- Free Place
  - This module must be used if a value in the data telegram of the cyclical data traffic should not be used (e.g. replacement of the Additional Cyclic Value)

Max. three modules can be active. By means of the configuration software of the Profibus master, you can determine the configuration of the cyclical data telegram with these modules. The procedure depends on the respective configuration software.

Note:
The modules are available in two versions:

- Short for Profibus master which support only one „Identifier Format“ byte, e.g. Allen Bradley
- Long for Profibus master only supporting the "Identifier Format" byte, e.g. Siemens S7-300/400

Examples of telegram configuration
In the following you will see how the modules can be combined and how the appendant data telegram is structured.

Example 1 (standard setting) with distance value and additional cyclical value:

- AI (PA-OUT)
- Additional Cyclic Value

Byte-No.	1	2	3	4	5	6	7	8	9	10
Format	IEEE-754-Floating point value				Status	IEEE-754-Floating point value				Status
Value	PA-OUT (FB1)				Status (FB1)	Additional Cyclic Value				Status

Example 2 with distance value without additional cyclic value:

- AI (PA-OUT)
- Free Place

Byte-No.	1	2	3	4	5
Format	IEEE-754-Floating point value				Status
Value	PA-OUT (FB1)				Status (FB1)

Data format of the output signal

Byte4	Byte3	Byte2	Byte1	Byte0
Status	Value (IEEE-754)			

Fig. 25: Data format of the output signal

The status byte corresponds to profile 3.0 "Profibus PA Profile for Process Control Devices" coded. The status "Measured value OK" is coded as 80 (hex) (Bit7 = 1, Bit6 … 0 = 0).

The measured value is transferred as a 32 bit floating point number in the IEEE-754 format.

Byte n								Byte n+1								Byte n+2								Byte n+3							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
VZ	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0	2^{-1}	2^{-2}	2^{-3}	2^{-4}	2^{-5}	2^{-6}	2^{-7}	2^{-8}	2^{-9}	2^{-10}	2^{-11}	2^{-12}	2^{-13}	2^{-14}	2^{-15}	2^{-16}	2^{-17}	2^{-18}	2^{-19}	2^{-20}	2^{-21}	2^{-22}	2^{-23}
Sign Bit	Exponent							Significant								Significant								Significant							

$$\text{Value} = (-1)^{VZ} \bullet 2^{(\text{Exponent} - 127)} \bullet (1 + \text{Significant})$$

Fig. 26: Data format of the measured value

Coding of the status byte associated with the PA output value

Status code	Description acc. to Profibus standard	possible cause
0x00	bad - non-specific	Flash-Update active
0x04	bad - configuration error	• Adjustment error • Configuration error with PV-Scale (PV-Span too small) • Unit irregularity • Error in the linearization table
0x0C	bad - sensor failure	• Hardware error • Converter error • Leakage pulse error • Trigger error
0x10	bad - sensor failure	• Measured value generation error
0x1f	bad - out of service constant	"Out of Service" mode switched on
0x44	uncertain - last unstable value	Failsafe replacement value (Failsafe-Mode = "Last value" and already valid measured value since switching on)
0x48	uncertain substitute set	• Switch on simulation • Failsafe replacement value (Failsafe-Mode = "Fsafe value")
0x4c	uncertain - initial value	Failsafe replacement value (Failsafe-Mode = "Last valid value" and no valid measured value since switching on)
0x51	uncertain - sensor; conversion not accurate - low limited	Sensor value < lower limit
0x52	uncertain - sensor; conversion not accurate - high limited	Sensor value > upper limit
0x80	good (non-cascade) - OK	OK
0x84	good (non-cascade) – active block alarm	Static revision (FB, TB) changed (10 sec. active, after the parameter of the static category was written)
0x89	good (non-cascade) – active advisory alarm – low limited	Lo-Alarm
0x8a	good (non-cascade) – active advisory alarm – high limited	Hi-Alarm
0x8d	good (non-cascade) – active critical alarm – low limited	Lo-Lo-Alarm

Status code	Description acc. to Profibus standard	possible cause
0x8e	good (non-cascade) – active critical alarm – high limited	Hi-Hi-Alarm

10.3 Dimensions

Housing versions in protection IP 66/IP67 and IP 66/IP 68; 0.2 bar

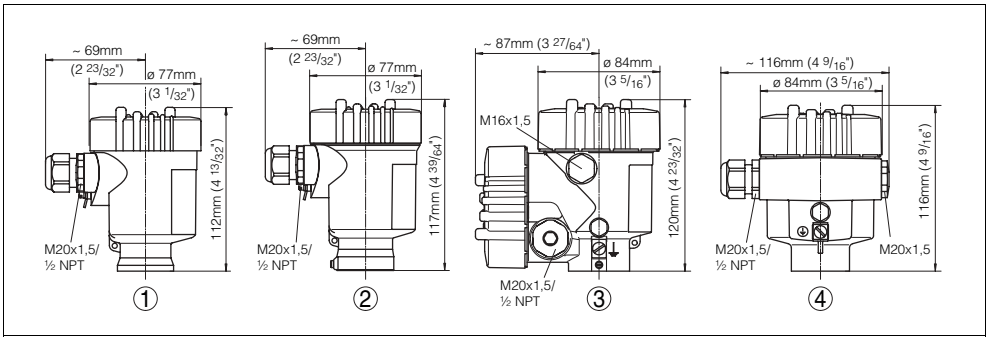


Fig. 27: Housing versions in protection IP 66/IP 67 and IP 66/IP 68; 0.2 bar (with integrated PLICSCOM the housing is 9 mm/0.35 in higher)
1 Plastic housing
2 Stainless steel housing
3 Aluminium double chamber housing
4 Aluminium housing

Housing in protection IP 66/IP 68, 1 bar

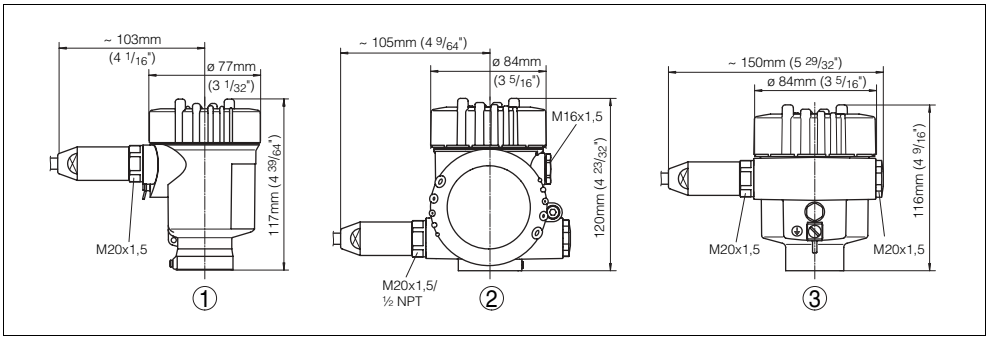


Fig. 28: Housing versions in protection IP 66/IP 68, 1 bar (with integrated PLICSCOM the housing is 9 mm/0.35 in higher)
1 Stainless steel housing
2 Aluminium double chamber housing
3 Aluminium housing

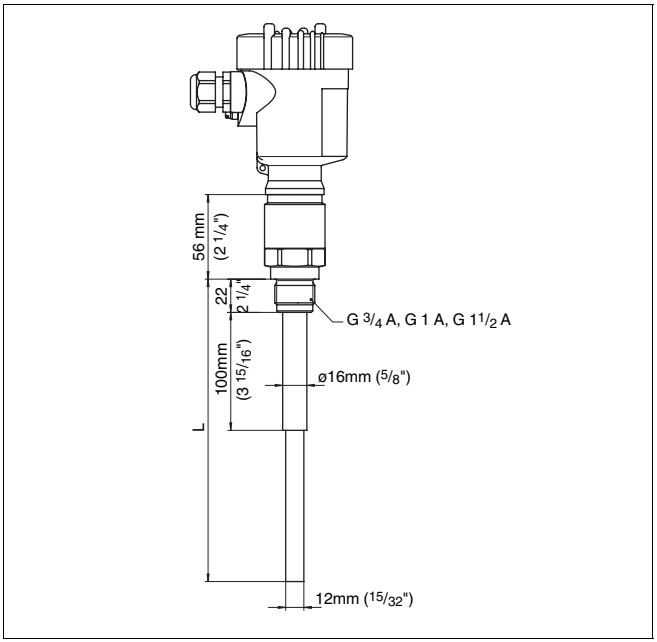


Fig. 29: VEGACAL 62 - Threaded version G1
L = Sensor length, see "Technical data"

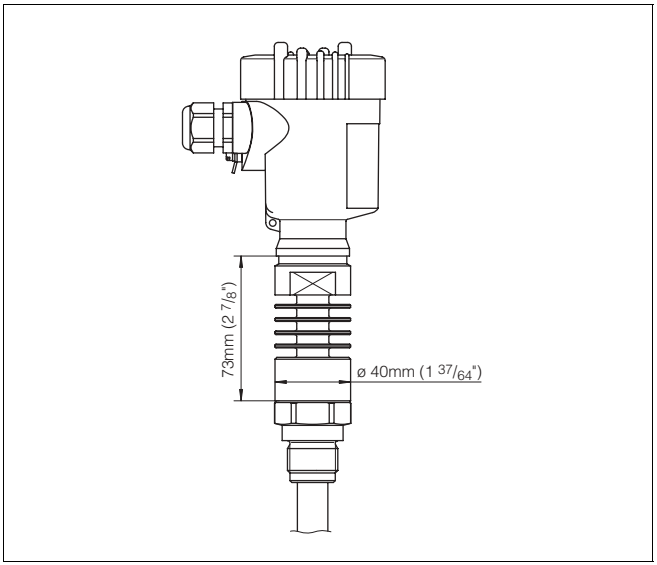


Fig. 30: Temperature adapter

10.4 Industrial property rights

VEGA product lines are global protected by industrial property rights.
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All statements concerning scope of delivery, application, practical use and operating conditions of the sensors and processing systems correspond to the information available at the time of printing.

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